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FUNGI OF CLAY MINES.*

BY PERLEY SPAULDING.

During the fall of 1906 and the spring of 1907, a number of clay mines in the western part of the city of St. Louis were visited for the purpose of determining the species of fungi occurring upon the timbers. These mines are entered by vertical shafts descending from 75 to 125 feet from the surface. From this entrance shaft galleries run horizontally, or nearly so, for distances varying from a half mile to nearly a mile, and numerous doors are usually located at various places along these galleries. Considerable water seeps into the tunnels from overhead, the amount varying at different seasons of the year, but usually being greater during the winter and spring. Immediately after leaving the foot of the vertical shaft one could detect no light whatever.

Along the galleries of these mines many timbers are used to prevent the caving-in of the roof. The timbers in deep coal mines are placed with considerable care, and are fitted together carefully, because of the great weight which they bear and the permanent nature of many of the galleries. In coal mines the tops of the braces standing each side of the tunnel are notched in such a way that the weight cannot possibly cause the cross piece to slide, or the notches may be cut in the end of the cross pieces. In either case the two timbers are fitted quite accurately together. At this point most of the decay occurs, and the set of timbers has to be removed because of a comparatively small defect.

In the clay mines, on the other hand, the timbers are intended only to prevent the caving-in of the earth immediately above the galleries. The timbers never prevent the settling of the large body of soil over the mine for one or two feet. In fact, a mined area could be detected by an expert by the dead trees standing on the surface which were killed by the settling earth pulling the roots in two. These timbers were light compared with those used in coal mining, and were rather carelessly placed in position. The top cross pieces were simple flat pieces of planking which were wedged in place on the supports. The rotting usually occurred in the oak supports. Because the weight sustained is not excessive the timbers rot practically throughout their diameter and for a considerable distance in length before they must be replaced. The clay mines are worked for a number of years, and the timbers must be renewed several times, as they last only about two to three years ordinarily. The timbers used were oaks of various species, and southern pine. The oak pieces were used as braces at the sides, while the cross pieces overhead were of pine. The oak pieces were usually from 6 to 9 inches in diameter and did not have the bark removed, while the pine pieces were sawn mostly from heartwood, and were usually 2 to 3 inches in thickness, and about a foot in width. The pine was used for the overhead timbering because of its greater resistance to rot, it being in direct contact with the soil. All of the timber used was wholly untreated, with the exception of being cut in the proper sizes and shapes for use. It is shipped from outside the city, and is usually somewhat seasoned by the time it is placed in the mine, although little or no attention is given to this detail.

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The fungi growing upon the timbers in these mines were situated under very abnormal conditions. There was absolutely no light, and the air of the mines was noticeably moister than that out of doors. The temperature never goes down to freezing, and is very uniform, ordinarily being cool enough so that one may wear a coat with comfort even in the hottest weather. In most of the galleries the sides and top were fairly moist, but not dripping, while in others the moisture was very noticeable, there even being small rivulets of water running along the tramway to the lowest parts of the mine. In all cases the water seeping into the mine had to be pumped out to prevent its filling the galleries.

Quite a number of wood-inhabiting fungi were found to be fruiting in a normal manner, but there were evidently others which were unable to form any recognizable sporophores. Of these latter, one was very abundant, forming dense rounded masses of white mycelium which were so full of water that they collapsed when taken in the hand. Every place where touched immediately assumed a water-soaked appearance. Still another formed black mats of coarse mycelium upon the outer surface of the timbers.

Somewhat to the writer's surprise, the fungi found upon the timbers in these mines were not those which are seen most commonly in the forests of the immediate vicinity of the mines but in a number of cases at least, were comparatively rare ones.

In one of the mines visited by far the most abundant fungus noted was a bright red one, which usually grew in the shape of an inverted cone, attached upon one side or at its apex. It was also present in the other mines, but in lesser numbers. This was identified as *Merulius rubellus* Peck. It was present on over one half of the upright oak timbers, and must be quite destructive, as the timbers last ordinarily but two to three years. Sometimes there were dozens of the sporophores on a single timber, and sometimes but one or two. Usually they were scattered, but they also occurred in large imbricated masses. The young stages were simply rounded knobs of reddish mycelium, of greater or less regularity. The presence of this fungus as the most abundant one in the mine is somewhat anomalous in view of its evident rarity in the forests of the vicinity. It has never been found by the writer anywhere in the vicinity, although he has collected quite carefully for several years in that locality. Glatfelter,[1] however, mentions finding it once, about one hundred miles away.

A single fungus was found occurring upon the pine cross pieces in considerable abundance; it grew in a resupinate form, and was identified as *Fomes annosus* Fr. This is known to be especially destructive to coniferous timber in

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[1] Glatfelter, N. M. Trans. Acad. Sci. St. Louis. **16**: 81. 1906.

Europe, and is not unknown in America. In most localities, however, it is not common. Its natural habitat is upon the roots of various coniferous trees, upon which it produces the so-called "root-rot". The conditions in the mine would seem to be very favorable for this fungus. It was practically the only one which was found occurring upon the pine timbers.

A considerable number of different species were found growing upon the oak timbers. A single sporophore of *Fomes applanatus* (Pers.) Wallr. was seen which came from the mine. It was perfectly normal in every way.

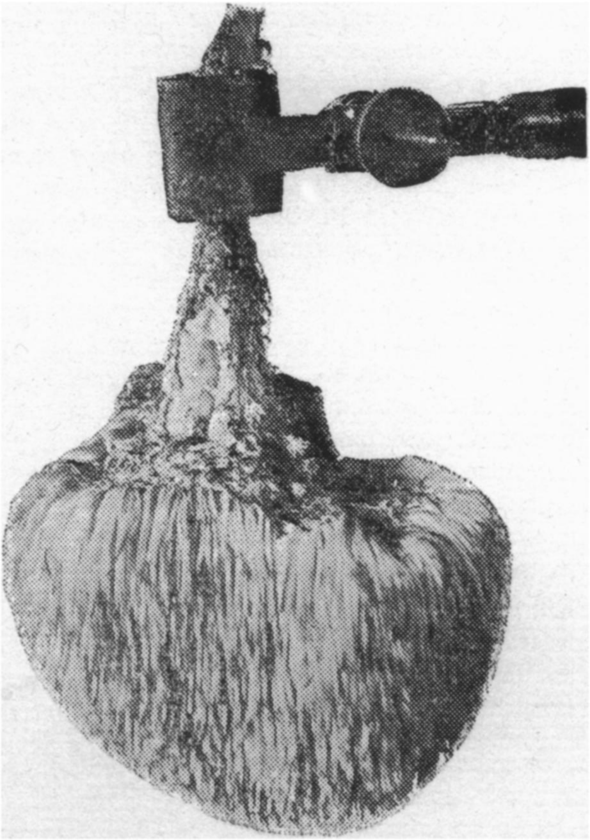
Lenzites betulina (L.) Fr. was found somewhat sparingly upon the oak timbers, and in most cases was normal in appearance.

Polystictus versicolor (L.) Fr. was also quite plentiful upon the oak timbers. It was very white in color, and did not exhibit the glistening zones on the upper surface at all distinctly, but otherwise seemed to be normal.

One of the more common fungi upon the oak was *Merulius lacrymans* (Jacq.) Fr. var. *verucifer* Quel. This was noted as being quite frequent in some of the mines, but was not seen in others; it is one of the most destructive fungi occurring in the mines, as a large proportion of the timbers which had been removed were affected with a dry rot such as is caused by the action of this fungus. A rotted stick six inches in diameter when struck sharply upon the ground would break in two very easily, thus showing the extreme weakening effect of this fungus upon the wood tissues.

Several other species of fungi were found occurring rather sparingly upon the oak timbers. *Stereum spadiceum* Fr. was found in a few cases. *Bulgaria inquinans* (Pers.) Fr. was found upon several of the timbers. It occurred in considerable number upon those timbers where it was found at all.

Hydnum Erinaceus Bull. of a rather peculiar type was found hanging from the oak timbers. It grew in the form of a rounded mass, hanging pendant from the lower end of a stout stem several inches in length, and about an inch in thickness (f. 1). Only two or three specimens of this fungus were found and they were all of the same type. *Hydnum coralloides* Scop. was found growing about normally upon a number of the timbers. *Hydnum artocreas* Berk. was found somewhat sparingly upon the bark of a few of the oak timbers in a single mine. This fungus is apparently rare in this country.



1. SPOROPHORE OF HYDNUM ERINACEUS FROM CLAY MINE, × ⅔.

A number of edible fungi were also found growing in the mines. Several groups of sporophores of *Coprinus atramentarius* (Bull.) Fr. were found growing upon the clay at the side of the galleries, and also overhead. They were normal, except that the stems were somewhat longer than usual.

Mules are used quite extensively in the mines to pull the cars along the tramways, and a considerable amount of manure accumulates, which is thrown to one side in some abandoned gallery. In all of the mines entered edible mushrooms of the *Agaricus* type were found growing upon this manure. One found in several mines has been provisionally identified as *Agaricus placomyces* Peck. The men were very well aware that these were indeed "mushrooms", and it was difficult to find enough mature specimens for the purpose of identification, because the men kept them picked closely and took them home to be cooked.

The peculiar feature of the growth of these fungi under such abnormal conditions was that so many of them grew in a nearly normal manner. As above mentioned, masses of mycelium of a number of other forms were very common, but they seemed to be unable to form perfect fruiting bodies. Experiments of the writer in cultivating the wood-rotting fungi for several years past have resulted in the production of perfectly normal fruiting bodies with but a single species, *Schizophyllum commune* Fr. Its absence in the mines was especially conspicuous, not a fruiting body of it being seen, except in one mine which seemed to contain more moisture than some of the others. This fungus seems to tolerate a higher degree of humidity in the air during the formation of perfect fruiting bodies than do most of the wood-inhabiting forms. In this mine the sporophores were numerous, but were somewhat abnormal. They were large, very pubescent, the gills were very wavy in outline, and many were suspended, being pendant at the center from a sort of stalk similar to the specimens of *Hydnum Erinaceus.* In some cases the entire fruiting body was composed of branched *Clavaria*-like growths, showing that the moisture was almost too great for normal sporophore formation. *Polyporus gilvus* Schwein. is exceeedingly common in the forests of that locality, but not a normal fruiting body was found in the mines. A single mass of brown mycelium, however, was found which very probably was an abortive sporophore of this species. From its known parasitism of roots of living trees one would expect to find *Armillaria mellea* Vahl. in the mines, but no specimens of it were noted, although it is not uncommon in the vicinity upon rotting roots and stumps.

The writer is indebted to Prof. Chas. H. Peck for identifying many of the fungi mentioned above.